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Published

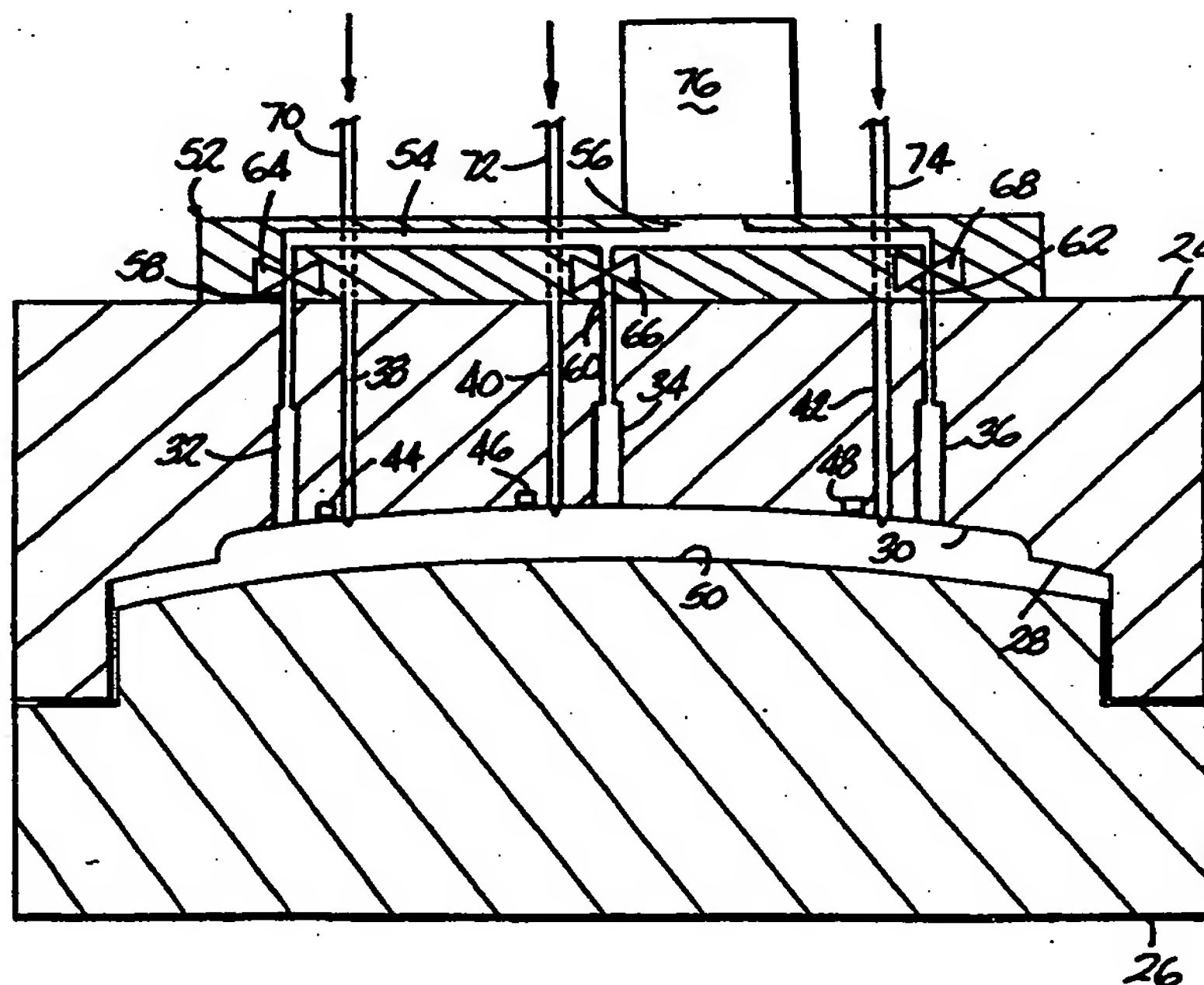
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(88) Date of publication of the international search report:

18 February 1999 (18.02.99)

(54) Title: GAS-ASSISTED INJECTION MOLDING OF LARGE PANELS WITH SEQUENTIAL GATING



(57) Abstract

Molding of relatively large articles such as automobile body parts by gas-assisted injection molding with sequential gating of injected thermoplastic resin into the mold cavity. Elongated ribs in the parts form gas channels and strengthening ribs for the parts. Structural parts are made by adhesively joining two such parts made by gas-assisted injection molding through a combination of hollow ribs and joining flanges at sides of the parts.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/04517

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B29C45/00 B29C45/17 B29C65/00 B62D29/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B29C B62D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 043 174 A (STAMICARBON) 6 January 1982 see the whole document	1,2,4-8, 10-16, 18-20,26
Y	EP 0 630 731 A (HETTINGA SIEBOLT) 28 December 1994 see the whole document	1,2,5,6, 8,11,13, 15,16, 19,20
Y	MICHAELI W ET AL: "KASKADENSPRITZGIESSEN ANALYSIERT UND MIT CADMOULD BERECHNET" PLASTVERARBEITER, vol. 45, no. 11, November 1994, page 96, 98, 100, 102 XP000482361 see the whole document	1,2,5,6, 8,11,13, 15,16, 19,20
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

25 June 1998

Date of mailing of the international search report

22.12.98

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/04517

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GAULER KURT: "BINDENÄHTE VON SPRITZGIESSTEILEN BESEITIGEN" PLASTVERARBEITER., vol. 37, no. 10, October 1986, SPEYER/RHEIN DE, pages 226-228, XP002069379 see the whole document ---	1,2,5,6, 8,11,13, 15,16, 19,20
Y	FR 2 702 990 A (EUROSTYLE) 30 September 1994 see page 5, line 15 - line 24; figure 2 ---	1,4,7, 10-12, 14,15, 18,26
Y	RUSCH K.C.: "PLASTICS IN AUTOMOBILES" February 1989, SOC. OF AUTOMOTIVE ENGINEERS INC., WARRENDALE XP002069380 16572 see page 155 - page 162 ---	1,4, 10-12, 14,15, 18,26
Y	US 5 401 459 A (NICHOLS JAMES M ET AL) 28 March 1995 see the whole document -----	1,4, 10-12, 14,15, 18,26

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 98/04517

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-27: Molding large articles by sequential injection of resin and injection of a gas.
2. Claims 28-36: Article assembled from injection molded shells with bonding surfaces having ribs with a hollow gas channel.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-27

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

ormation on patent family members

International Application No

PCT/US 98/04517

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0043174 A	06-01-1982	NL 8003800 A JP 57045039 A	01-02-1982 13-03-1982
EP 0630731 A	28-12-1994	DE 630731 T	24-08-1995
FR 2702990 A	30-09-1994	NONE	
US 5401459 A	28-03-1995	US 5716163 A	10-02-1998